# Delivering Trauma Mastery with an International Trauma Masters

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Abbreviations
E-learning: Electronic Learning
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MSc: Master of Science Degree
PGCert: Postgraduate Certificate
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# ABSTRACT

## INTRODUCTION

Trauma is a global problem. The goal of optimising multidisciplinary trauma care through speciality education is a challenge. No single pathway exists to educate care providers in trauma knowledge, management and skills.

Queen Mary University of London (QMUL) devised an online electronic learning (e-learning) Master's degree (MSc) in Trauma Sciences in 2011. E-learning is increasingly popular however low progression rates question effectiveness. The further post-graduate impact is unknown.

Our goal was to establish whether this program is a successful method of delivering multidisciplinary trauma education to an international community. We hypothesized that graduating students make a global impact in trauma care, education and research.

## METHODS

The Trauma Sciences MSc programs launched in 2011. Electronic surveys were distributed worldwide to students who successfully completed the program between 2013 to 2016. Graduation rates, degree/qualification awarded, clinical involvement in trauma management, presentation of MSc work, academic progression and roles in trauma education were explored. Supporting demographics were extracted from the QMUL student database.

## RESULTS

A total of 176 students, of 29 nationalities, enrolled in the two year course between 2011 and 2014. Clinical backgrounds included multi-speciality physicians (83.5%), nurses (9.6%) and paramedics (6.8%). 119 (67.6%) graduated within the study period, 108 (60.8%) with the full masters award. Completion was independent of clinical background ($p=0.20$) and age ($p=0.99$). Highest completion rates were seen in students from Australia and New Zealand, Asia and Europe ($p=0.03$).




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All survey responders were currently providing regular clinical care to trauma patients. 73% (n = 36) were delivering trauma education, many at national or international level. 49% (n=24) had presented work from the MSc and 23% (n = 11) published their dissertation.12% (n=6) subsequently enrolled in a PhD program.

## CONCLUSION

Compared with other e-learning courses this Masters program has an enviable completion rate. Graduates go on to make an international multidisciplinary impact with diverse roles in clinical management, research and trauma education.

This programme provides a robust trauma education curriculum. The QMUL Trauma Sciences MSc program is an excellent resource for clinicians participating in any form of trauma care or who wish to augment sub-speciality training in trauma.

LEVEL OF EVIDENCE

Level III, Prognostic and Epidemiological,

## HIGHLIGHTS

- Electronic learning is an effective medium for delivering postgraduate trauma education.
- A masters degree in trauma sciences facilitates worldwide multidisciplinary trauma care.
- Making an impact in trauma education in low income/resource countries continues to be challenging.
- Direct improvements in patient outcome due to educational programs are difficult to assess.

## KEYWORDS

Electronic Learning, Trauma, Distance Learning



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## INTRODUCTION

Optimizing trauma care through improved access to education is a global concern. Internationally, injury is the leading cause of years of potential life lost (YPLLs). Trauma associated death and disability occurs primarily in the young, working population. Ninety percent (90%) of the worldwide burden of trauma deaths occurs in low and middle income countries.

In 2007 the World Health Assembly adopted a resolution (1) stating that 'additional efforts should be made globally to strengthen provision of trauma and emergency care so as to ensure timely and effective delivery to those who need it'. Continuing medical education in trauma care is a key component for development (2).

Trauma education and training models vary greatly across the globe. An international survey of medical students highlighted significant discrepancies in core trauma education (3). Numerous postgraduate focused courses exist, including Advanced Trauma Life Support (ATLS) (4), Pre-Hospital Trauma Life Support (PHTLS) (5), Anaesthesia Trauma and Critical Care (ATACC) (6) and BASICS (7). These courses have an international reach but are limited in scope by course duration. They focus on initial assessment and care rather than definitive management (8) and teaching is largely driven by protocol rather than understanding. Concerns have been raised about skill retention (9) and there is limited evidence of impact on patient outcome with this type of curriculum (10,11).

Queen Mary University of London (QMUL) devised an online electronic learning (e-learning) Master's degree in Trauma Sciences in 2011. The course runs as a part-time distance-learning program with an optional blended two-week residential summer school. Entry requirements are a Medical degree or Paramedic/Nursing degree with an upper second class honours or equivalent.

The masters program is based on a two year course program (Figure 1). Year one consists of 8 taught modules and concludes with the optional residential summer school. The summer



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school is taught by an international faculty and is based in London. Learning methods include didactic lectures, pre-hospital and emergency department simulation, orthopaedic and thoracotomy workshops and a group project which promotes resource management, team building and performance improvement exercises. Year 2 consists of a Masters dissertation project. Teaching mediums include online lectures, interactive tutorials, multiple choice and written assessments. Each 15 credit module involves approximately 30 hours of contact time plus 120 hours of independent study. QMUL academic standards are in keeping with the Quality Assurance Agency for Higher Education, UK (www.qaa.ac.uk). The course has achieved accreditation by the Royal College of Surgeons of England and is recognised by the Royal Australasian College of Surgeons.

Our goal was to establish whether this program is a successful method of delivering multidisciplinary trauma education to an international community with a lasting impact. Success was defined as an enrolled student completing the program with a Masters degree, Postgraduate Certificate or Postgraduate Diploma.

Completion rates published for large scale online courses have been reported as low as 4% of those initially enrolling (12). We aimed to define our student base, completion rates and assess effectiveness both during and following the program. Whether graduation from a postgraduate educational program translates to trauma care improvements at the health system or patient level is currently unknown. We hypothesized that students successfully graduating make a global impact in clinical trauma care, education and research.

## METHODS

This study was conducted in two phases:

1) A retrospective analysis of the QMUL student database to assess program completion rates and effectiveness.
2) A follow up survey of MSc alumni to assess the impact that graduating students have on



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the global trauma community.

This study was assessed as not requiring formal institutional review board review and was carried out in cooperation with the QMUL Alumni Affairs Office. QMUL maintains a student record database which includes demographic data from the admission process through to graduation. We conducted retrospective analysis of this database for students commencing the Masters in Trauma Sciences degree in years 2011 to 2014. Data capture was conducted in August 2017 allowing sufficient time for all cohorts to complete the 2 year program

Data on student background on admission was extracted, including clinical backgrounds, subspecialty training, current clinical roles, nation of residence, age, and degree outcome. Nation of residence was analysed geographically as North America, Middle East, Asia, Australia/New Zealand, Europe and Africa. Clinical roles were grouped under 5 headings, 1 each for nurses and paramedics and 3 for physicians. Training systems vary around the world and training levels are not necessarily comparable. As such we constructed 3 groups; consultant/faculty, senior trainees (registrars, senior house officers, medical officers) and junior trainees (house officers, foundation year doctors) to allow international comparison.

Degree outcome was defined by the QMUL academic regulations (13). Those completing 120 credits in year one and the dissertation in year two (60 credits) were awarded a Master of Science degree (MSc). Students completing 120 credits in year one but not continuing to year two were awarded a Postgraduate Diploma (PGDip) and those competing 60 credits in year one but not continuing to year two were awarded a Postgraduate Certificate (PGCert).

A descriptive survey of those graduating from the Trauma Sciences MSc program between 2013 and 2016 was constructed electronically using Google forms (Appendix 1). Students were contacted using e-mail addresses held by the University Alumni office with subsequent follow up e-mails. The survey was also advertised using social media (a closed Facebook group) and at a university alumni event for the program. A weblink allowed survey access



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and identity was verified against university records. Entry into a prize draw for a £25 gift voucher was offered for completion. The survey duration was for a 1-month period between November and December 2017. Clinical involvement in trauma management, presentation and publication of MSc work, further academic progression and roles in trauma education were explored.

Parametric data are presented as Mean +/- standard deviation and analysed using student T-tests. Non-parametric data is presented as median (interquartile range, IQR) and analysed using Chi squared testing and Spearman rank correlation. P-value will be set at <0.05 for statistical significance. Statistical analysis was conducted using Microsoft Excel.

## RESULTS

We obtained all demographic data for students undertaking the Masters in Trauma Sciences during the study period. One hundred and seventy-six students of 29 different nationalities enrolled over the 4-year period (Figure 2). The majority of enrolled students were physicians (83.5%), most of whom were junior and senior trainees, and were based in Europe (66.5%). 52.8% of students were located in the United Kingdom.

One hundred and nineteen students (67.6%) graduated within 2 years of commencing. One hundred and eight students (60.8%) graduated MSc, with the remaining graduating PGDip (2.8%) and PGCert (3.4%). Of the 57 students who did not complete within the two years, 10 (17.5%) completed after the initial 2 year course duration and 5 (8.8%) were re-sitting outstanding modules at the time of the study. The remaining 42 (73.7%) have withdrawn from the course, thus the overall attrition rate is 23.9%.

The median age of students was 30 (IQR: 27 – 36) years old. Student age was not a predictor of success ($p = 0.96$) and age did not correlate with the overall score achieved (r = 0.05). The mean age for passing candidates was 31.0 ± 6.8 years (MSc), 34.6 ± 12.1 (PGDip), 34.2 ± 9.8 (PGCert). The mean age for unsuccessful candidates was 34.8 ± 9.5. Success was also



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independent of clinical role (*p=0.20*, *Figure 3*). A trend is seen for a lower success rate among consultant/faculty physicians to whom the majority of PGDip and PGCerts were awarded. Geographic residence influenced success rate (*p=0.03)*. The highest rate of students graduating with the full MSc was seen in Asia (72.7%). The pass rate in Europe was 70.4%, with a pass rate of 68.9% in the United Kingdom. Success rates in North America (40.0%), the Middle East (50.0%) and Africa (57.1%) were lower than those seen in other regions.

Of the 119 graduating students, we were able to obtain updated contact information for 117. Fifty (42.7%) students completed the survey within the study period. There was no statistical difference between responders and non-responders with respect to age, gender or geographic location (Figure 3 & 4). There were comparable numbers of nurses and paramedics in both groups, however there was a significant under-representation of clinicians in the responder groups (38.7% of clinicians responded, n = 38, p = 0.03). Only 1 of the 11 graduating with a PGCert or PGDip responded.

All responders were currently providing regular clinical care to trauma patients with 79.6% (n= 40) doing so on at least a weekly basis. Eighty-eight percent (n=44) of responders were working in a major trauma centre, trauma unit or established pre-hospital trauma system. Only 14% (n= 7) were providing trauma care in rural environments and 2% ( n= 1) providing care in low/middle income countries. The majority of responders were delivering trauma education (73.5%, n = 37, Figure 5) . Thirty-one percent (n=15) of graduates were doing so at a national or international level. Significantly more clinicians (78.9%, n = 30) and nurses (71.4%, n = 5) delivered teaching compared with paramedics (40% n = 2), p<0.001)

Fifty percent (n = 25) of graduates had presented work undertaken as part of the MSc program. (Figure 6), of which 84% ( n = 21) was presented at national or international conferences. At the time of data collection 22.0% (n = 11) of graduates had published their dissertation in peer reviewed journals with a further graduate preparing to submit (Figure 6). Eight-two percent ( n = 9) of publications were from middle or consultant grade clinicians. The remainder were from nurses. No paramedics published MSc work. Twelve percent ( n =



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6) of  graduates were in a PhD program and a further 4.0%  (n = 2) held formal academic positions.

## DISCUSSION

### Electronic Learning and Completion Rates

E-learning is an increasingly attractive and popular delivery method (14). Advances in technology allow worldwide delivery of high quality content and, perhaps more importantly, have facilitated cost effective international real time communication. Teaching sessions are run with participants from multiple continents and time zones. Assessments may be submitted from around the world in seconds. This allows consolidation of experience from international faculties in niche subjects, such as trauma management, which can be delivered to a worldwide community.

Online learning has been associated with lower marks (12) and pass rates (12) than traditional face-to-face method and low progression rates have raised questions about effectiveness (15-17). Worldwide graduation rates as low as 0.5 -22% have been reported (18-20). By comparison, the graduation rate for a UK domiciled full-time first-degree conventional face-to-face course is greater than 80% (21). Similar findings are observed in the United States (20).

The graduation rate at 2 years of the QMUL Trauma Sciences Masters is 67.6%, a completion rate that is almost comparable with conventional face-to-face courses. Almost 90% graduate with a full MSc. The reasons for this are almost certainly multifactorial – but one important cause may by admission criteria. Our students have already proven themselves in an academic environment which may not be the case with other distance learning programs.

### Age and Clinical Role



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It is reassuring that success in the course is independent of both clinical role or age. Older students have voiced concerns about the impact work, family and the time interval since they have last undertaken academic study will have on program performance. Our findings are in keeping with other studies (17, 22-24) which demonstrate that age does not influence success in distance learning programs.

We found that the clinical occupation of the student did not influence success. Students from both paramedic and nursing backgrounds expressed concerns about performance, specifically comparing themselves with physicians. Increased anxiety among nurses undertaking masters' degrees has been previously documented (25) and nurses undertaking both masters and doctorial programs have high attrition rates (26). Paramedic training has only seen a development of a formalised academic training track in the past 20 years (27) and there is an absence of research investigating paramedics undertaking postgraduate education.

Cognitive intelligence was voiced as a perceived issue by students with both nursing and paramedic backgrounds when comparing themselves with physicians, especially in academic domains. It is important to address these concerns. We have not measured cognitive intelligence but may assume that the admission criteria select a population able to undertake such an academic pursuit. Nurses and paramedics are not required internationally to undertake an undergraduate degree. By setting this as an admission standard we may be self-selecting a population who have chosen to do this.

We have found the majority of our students, especially those with nursing or paramedic backgrounds, to be extremely motivated. Nurses undertaking masters degrees have high achieving tendencies compared with the general population (25) and those completing post graduate degrees demonstrate high levels of resilience (26). Perseverance and passion for long-term goals (Grit) is a known predictor of success (28). Motivation and grit may be different for each of the groups. Nurses and Paramedics join the program after having completed considerable clinical experience and at a career point where they were wishing to develop a special interest or move into advanced practice. Physicians in training tended to



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join the masters program at earlier career points, while they were developing a portfolio for applications to specialty training or for consultant/faculty posts. The motivation to complete the masters is supplemented by the reward it may facilitate within their career. While not statistically significant, the trend in the data demonstrated that the group with the lowest success rate were consultant/faculty physicians. This group has very different motivational factors and competing interests and may, as a result, be less 'grittier' for this particular end point. An additional factor may be that consultant/faculty students may complete the curriculum and then see no value added benefits to writing the thesis since they have now acquired the advanced knowledge they were interested in.

We may speculate that some of the positive features observed highlight a potentially complimentary link between the masters program and an individual's regular clinical role. It is important to consider how a part-time program compliments the individuals career and life. An individual's clinical role may be motivational and act as a support structure during the masters and as a platform to support further achievement following graduation. It may be that a part-time approach alongside a regular clinical role is an optimal strategy for this type of post graduate education.

Geography and Internet Access

Trauma is a global disease and it is interesting that geographic origin of the students played a significant influence on successful completion rates. Trauma is a growing cause of morbidity and mortality in the developing world, especially in Africa, Asia and Latin America (29). This data has demonstrated that the program penetration into these regions could be improved. Finance, technology and resources impose greater restrictions on students joining the program from the developing world and it is important that these students can be supported. QMUL in conjunction with Trauma.org has offered a 50% scholarship award since the inception of the program and in conjunction with the Commonwealth Scholarship Committee, has recently been able to offer tuition support for students from low-middle income countries (LMICs). This scholarship scheme has increased the enrolment numbers for students who would not otherwise have the opportunity due to financial constraints.



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We did not expect that students from Australasia and Europe were more likely to graduate than students from North America, the Middle East and Africa. This geographical difference has not been reported in previous studies of e-learning programs. There are a number of possible reasons for this unanticipated finding. This type of program requires computer access, dependable technology and reliable high quality internet connectivity (30). Compromising these elements impacts on learning and success (30-33) although as technology matures and computer literacy is taught in schools this effect is less prominent (34). Differing work patterns may influence the complimentary nature of the part-time program and time differences may influence participation in interactive elements. There may also be value differences in the meaning of an MSc in different countries. In the United States advanced degrees such MSc and PhDs are not awarded in clinical disciplines and therefore initial presumed value in obtaining an advanced degree dissipates and the motivation for completion of what be perceived as a lesser value degree causes diminished motivation for completion.

Impact on the Trauma Community.

The master's degree was created to improve global trauma management and care. It is unknown if graduation from a postgraduate educational program translates to improvements in trauma care at the patient or system level. Attempts to measure the impact of a distance learning course on patient centred outcomes in family medicine have resulted in uncertainty (35).

Graduates self-report significant roles in trauma education, clinical management and research. Work, predominantly undertaken during the dissertation year, was presented and published. These results are appealing and demonstrate the ability of the masters program to cascade and develop knowledge throughout the wider clinical community. The high number of graduates continuing to be involved in education is particularly pleasing and may highlight a demand for teaching in basic educational techniques in future years.



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The data demonstrates some areas where greater reach is required. At the time of writing, paramedics did not go on to present or publish dissertation work. We must ask how we can provide appropriate support in these areas. The majority of clinical work is taking place in established trauma systems. We must ensure that the program also has an impact in non-established systems, low/middle income countries and rural environments to allow all trauma patients to benefit.

Strengths and Limitations

This study has several limitations. The retrospective database design means it is exposed to bias. The university database has been well maintained but is dependent upon previous accurate record keeping.

The survey was self-reported and those who had produced work following the degree may be more compelled to reply. The alumni students were a self-selected motivated group. It is difficult to confirm whether the activities these students undertook following graduation were as a result of the masters or something this group would have achieved by a different route. It would be very interesting to see if clinician's with an interest in trauma, but who don't undertake a masters degree, go on to achieve the same as our student cohort. This type of study would be logistically demanding but certainly warrants further work.

It is also important to consider whether we are asking and investigating the correct question. The aim of improving education in trauma management is to improve the care trauma patients receive. Completing a masters degree, and undertaking the many activities described, are easily measurable outcomes however give no indication as to what direct or indirect impact that student will then have on the individual patient or population. Assessing the direct effectiveness of clinical education on patient management and outcome remains challenging.

## CONCLUSION



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The QMUL part-time distance learning masters in Trauma Sciences curriculum appears to provide a powerful adjunct to train clinicians in the concepts required to improve trauma care delivery globally. This online curriculum demonstrates a superior completion rate compared with those previously reported for other e-learning courses. The part-time nature of the course alongside a clinical role may be an optimal method of studying this type of subject. It is difficult, however, to ascertain the direct impact the program has on patient centred outcomes.

Graduates play multiple roles in trauma education, management and research. We have shown the program has an international impact with diverse roles in clinical management, academia and trauma education. The program can celebrate its multidisciplinary nature and growing global spread but needs to increase its penetration in the developing world and to further analyse the potential impacts on educational, clinical outcomes and trauma system and policy developments.

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Figure 1: Masters in Trauma Science Structure

Year One Modules (4 weeks in length, 15 credit hours)

1) Trauma the Disease
2) Haemorrhage and response to injury
3) Brain and spinal cord injury
4) Research methods
5) Torso trauma
6) Extremity and Vascular Trauma
7) Critical Care
8) Choice of an elective module
    a. Trauma Nursing
    b. Burns and Wound Healing
    c. Military and Humanitarian Trauma

Years Two

- Masters Dissertation Project (9 months in length, 60 credit hours)



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Figure 2: Student Demographics

| | |
|---|---|
| Age at Program Commencement (years ± IQR) | 30 (27 – 36) |
| Age Range at Program Commencement (years) | 23 - 64 |
| | |
| Clinical Background (n (%)) | |
| Physician | 147 (83.5) |
| *Consultant/Faculty* | *16 (9.1)* |
| *Senior Trainee* | *83 (47.1)* |
| *Junior Trainee* | *48 (27.2)* |
| Nursing | 17 (9.6) |
| Paramedic | 12 (6.8) |
| | |
| Geographic Residence (n (%)) | |
| Africa | 7 (4.0) |
| Asia | 11 (6.3) |
| Australia/New Zealand | 22 (12.5) |
| Europe | 117 (66.5) |
| Middle East | 4 (2.3) |
| North America | 15 (8.5) |



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Figure 3: Clinical Role as a Predictor of Successful Completion.

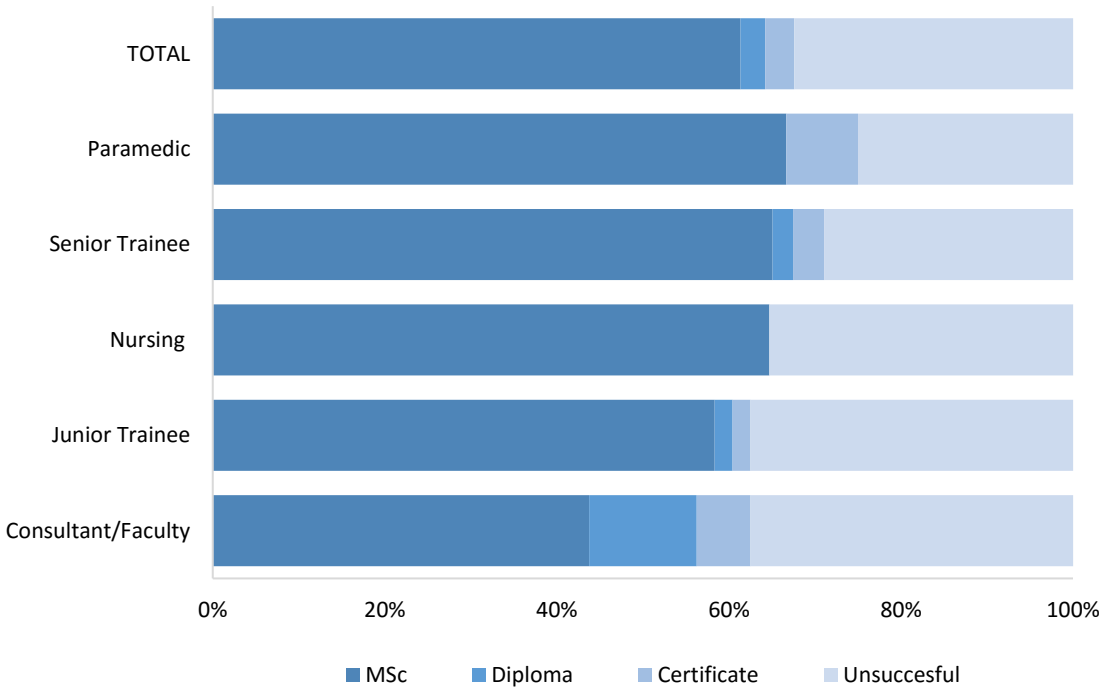




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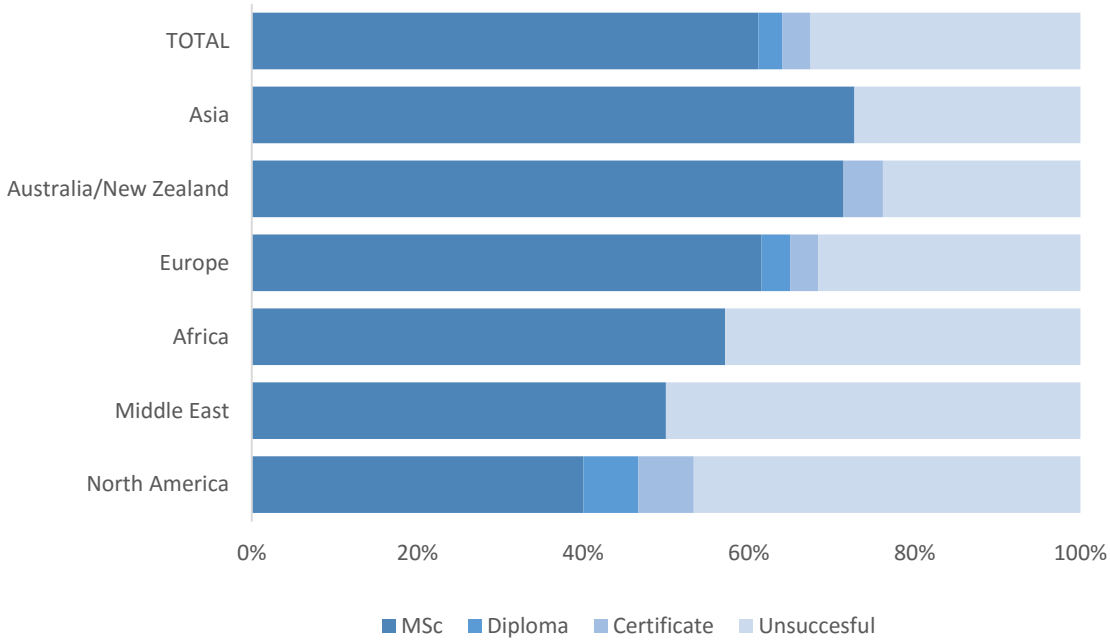
Figure 4: Geographic Residence as Predictor of Successful Completion






Abbreviations

E-learning: Electronic Learning
QMUL: Queen Mary University of London
MSc: Master of Science Degree
PGCert: Postgraduate Certificate
PGDip: Postgraduate Diploma
IQR: Interquartile Range

Figure 5: Participation of MSc Alumni Students in Trauma Education (%)

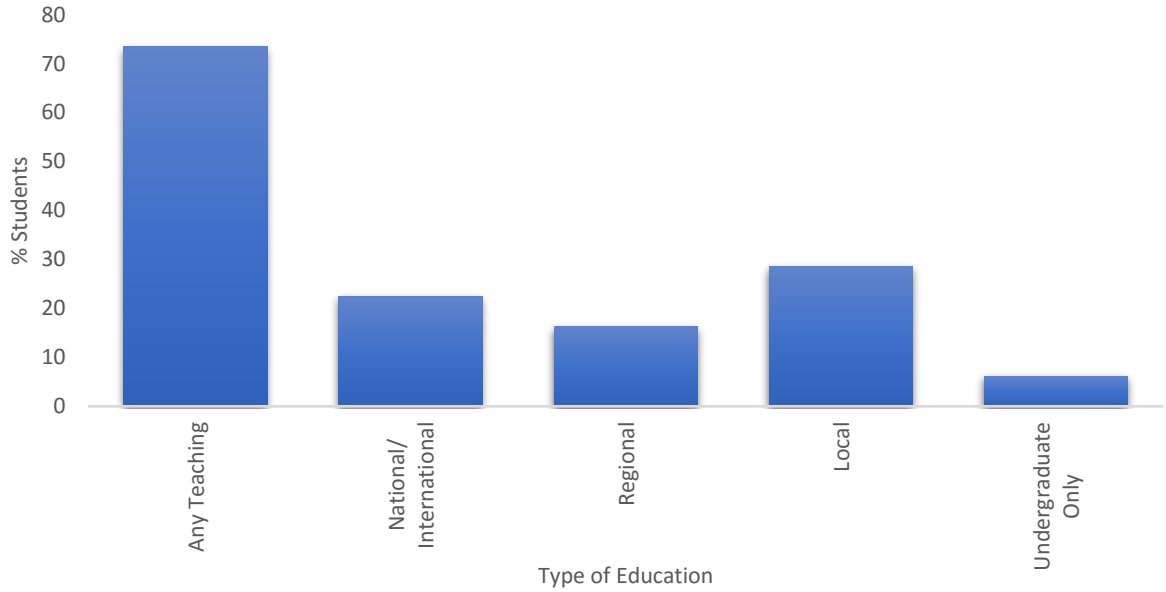





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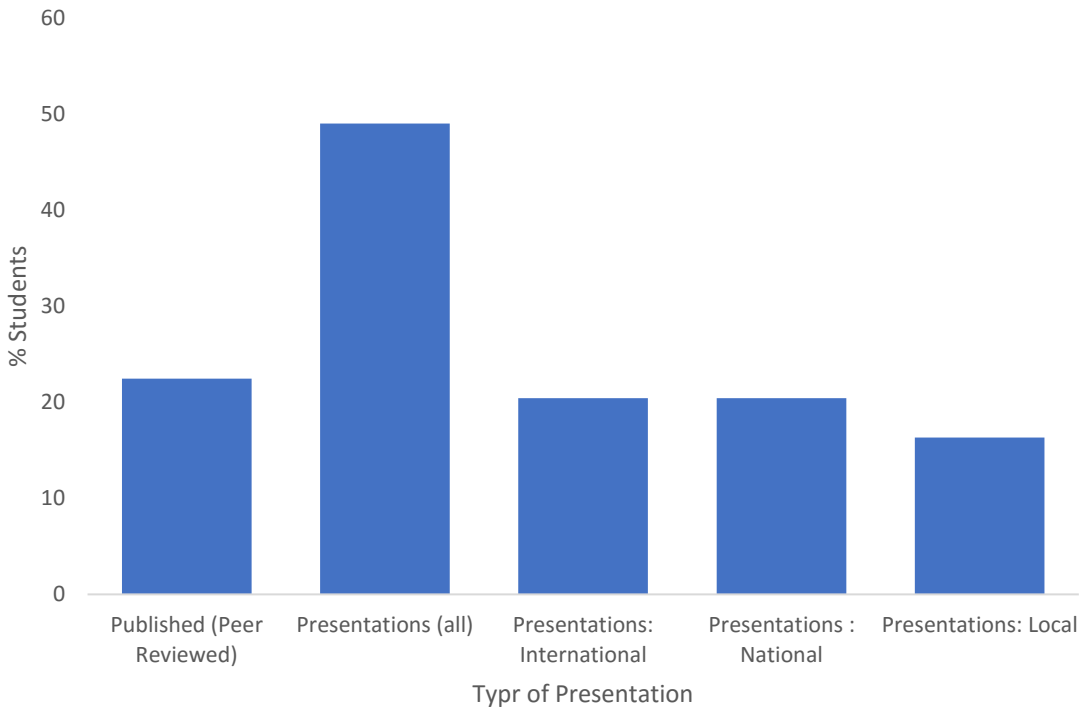
Figure 6: MSc Alumni Students Presented and Published Work (%)



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